Furniss

344
Homoptera-Hemiptera
BMNR 344 1281

FURNISS RLF
WHITESIDE JMW
BUCKHORN WJB
WEAR SW
CAROLIN VMC
WRIGHT KHW
COULTER JHC
POPE RSR
ORR JMW
THOMAS

U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
Division of Forest Insect Research

BLACK PINE-LEAF SCALE AND NEEDLE DIEBACK ARROWHEAD-CRESTLINE AREA SAN BERNARDINO NATIONAL FOREST, CALIFORNIA MAY, 1956 APPRAISAL SURVEY

Introduction

In recent months, ponderosa and Jeffrey pines in certain areas around Lake Arrowhead and Crestline, San Bernardino National Forest, have been affected by a progressive browning of the needles, hereafter referred to as needle dieback. The net result has been a general deterioration of the crowns and eventual death of occasional trees and groups of trees. Until recently, this condition was thought to have been caused by the black pine-leaf scale, Nuculaspis californica (Coleman). On February 1, R. C. Hall and J. W. Kimmey of the California Forest and Range Experiment Station made an examination of the decadent trees in the Crestline-Arrowhead area and concluded that most of the seriously affected trees had little evidence of scales. Kimmey also could find no symptoms of needle fungus attack. They concluded that the cause of the browning of the needles was unknown. Since the examination on February 1 was of a preliminary nature, it was deemed necessary to make a more complete appraisal of the association of the scale and the needle dieback.

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Accordingly, during the week of May 21, 1956, R. C. Hall, R. E. Stevens, and J. H. VrMeer of the Experiment Station made a survey of the area to attempt to determine whether or not these two problems were related, to assess their relative importance, and to delineate the areas of heaviest damage.

Survey Method

Scouting indicated no recognizable differences between trees in the stand and those adjacent to the road, so sampling was done along the roadsides throughout the area. Plots were taken at quarter-mile intervals and estimates were made of the general intensity of both the scale population and crown deterioration on the trees within each plot. At every fourth station (each mile), ten trees selected at random were examinad individually and rated in regard to needle length and complement, degree of scale infestation, and degree of needle dieback.

Results

A total of 184 sample plots were checked, of which 44 were 10-tree plots. This amounted to running 44 miles of roadstrip in the area.

Generally speaking, the scale and the needle dieback were not associated. Of the 444 trees examined, only 29, or 6.5 percent, of the trees had both a scale population and browning needles.

There was a marked difference in the needles injured by scale feeding and those that had died back but were not infested. Scale damage, when severe, caused a fading from the base of the needles, progressing toward the tip, but rarely was the entire needle affected. In the case of the dieback, fading started at the tip of the needle and progressed toward the base. In the most severe cases all the needles on a tree were completely faded with only the buds remaining green. Where the dieback was not severe, only the tips of the needles were affected.

1. Association of needle dieback and crown decadence.--There was evidence that where needle dieback was medium to heavy it was associated with short needles and a sparse needle complement (tables 1 and 2). Of the trees with short needles, 24.1 percent had a medium amount of dieback and 65.6 percent had a heavy amount. Of those with sparse complement, 67.7 percent had medium or heavy needle dieback. Of those with very sparse complement, the dieback on 88.9 percent was heavy.(table 5).

2. Association of scale infestation and crown decadence.--Compared to the dieback, the scale problem appeared to be rather minor. There appeared to be no close association between scale populations and crown decadence, as indicated by the length or abundance of the needles (tables 3 and 4). Of the trees with short needles, none had heavy scale populations and only 11.1 percent had medium scale populations. Similarly, of those with sparse complements, only 2.1 percent had heavy scale populations and 7.2 percent had medium populations. Of the trees with very sparse complements, none had any scale populations (table 5).

3. Percentage of trees with needle dieback and scale.--Of the total trees examined, 37.4 percent had needle dieback and only 18.7 percent had scales. It is significant to note that on 14.5 percent of the trees the dieback was severe, whereas less than 1 percent were heavily infested with scales (table 6).

4. Size of tree affected by needle dieback.--The dieback was more or less evenly distributed among trees of all sizes. There appeared to be no special association between the dieback and any particular diameter class (table 7). However, there was a noticeable difference in the effect on the smaller trees, particularly those in the understory. Many of these smaller trees appeared to be dead or very nearly so.

Table 1.--Association between the intensity of needle dieback and needle length

Dieback	Needle length						Total
	Long		Medium		Short		
	Number	Percent	Number	Percent	Number	Percent	
None	141	50.7	135	48.6	2	0.7	278
Light	3	60.0	1	20.0	1	20.0	5
Medium	20	20.6	70	72.2	7	7.2	97
Heavy	6	9.4	39	60.9	19	29.7	64

Table 2.--Association between the intensity of needle dieback and needle complement

Dieback	Needle complement								Total
	Heavy		Medium		Sparse		Very sparse		
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
None	114	41.0	132	47.5	31	11.1	1	0.4	278
Light			5	100.0					5
Medium	17	17.0	51	51.0	32	32.0			100
Heavy	2	3.2	18	29.5	33	54.1	8	13.2	61

Table 3.--Association between the intensity of leaf scales and needle length

Scales	Needle length						Total
	Long		Medium		Short		
	Number	Percent	Number	Percent	Number	Percent	
None	152	42.1	186	51.5	23	6.4	361
Light	17	30.9	37	67.3	1	1.8	55
Medium	3	12.0	19	76.0	3	12.0	25
Heavy			3	100.0			3

Table 4.--Association between the intensity of leaf scale and needle complement

Scales	Needle complement								Total
	Heavy		Medium		Sparse		Very sparse		
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
None	117	32.4	162	44.9	72	19.9	10	2.8	361
Light	10	18.2	30	54.6	15	27.3			55
Medium	6	24.0	12	48.0	7	28.0			25
Heavy			1	33.4	2	66.6			3

Table 5.--Percentage of trees with short needles and sparse complement associated with needle dieback and scales

	Dieback				
	None	Light	Medium	Heavy	Heavy & Medium
Short needles	6.9	3.4	24.1	65.6	89.7
Sparse complement	32.3	0.0	33.3	34.4	67.7
Very sparse complement	11.1	0.0	0.0	88.9	88.9
	Scales				
Short needles	85.2	3.7	11.1	0.0	11.1
Sparse complement	75.1	15.6	7.2	2.1	9.3
Very sparse complement	100.0	0.0	0.0	0.0	0.0

Table 6.--Percentage of trees with needle dieback and scales

Intensity	Dieback only	Scales only
None	62.6	81.3
Light	1.1	12.4
Medium	21.8	5.6
Heavy	14.5	0.7

Table 7.--Association of needle dieback and tree diameter in areas where dieback was found

Diameter range	Total number of trees	Number affected	Percent affected
2-8"	77	39	50.6
10-16"	121	52	43.0
18-24"	87	48	55.2
26-32"	35	14	40.0
34-48"	30	13	43.3

5. Distribution and intensity of needle dieback.--The dieback appears to be restricted to the Crestline-Arrowhead area of the San Bernardino National Forest and has not been observed anywhere else. Heaviest damage occurs in the area around Crestline, with moderate damage in the Lake Gregory area and light damage around Lake Arrowhead (fig. 1).

Discussion

It is estimated that 37.4 percent of all the trees in the Crestline-Arrowhead area are affected by needle dieback. This condition is associated with crown deterioration in a high percentage of the affected trees, and some smaller trees have died. It is not associated with the black pine-leaf scale. The most serious consequence of the dieback is the fact that many of the seriously affected trees become susceptible to attacks by bark beetles. This may mean that additional efforts will be needed to keep bark-beetle outbreaks from developing.

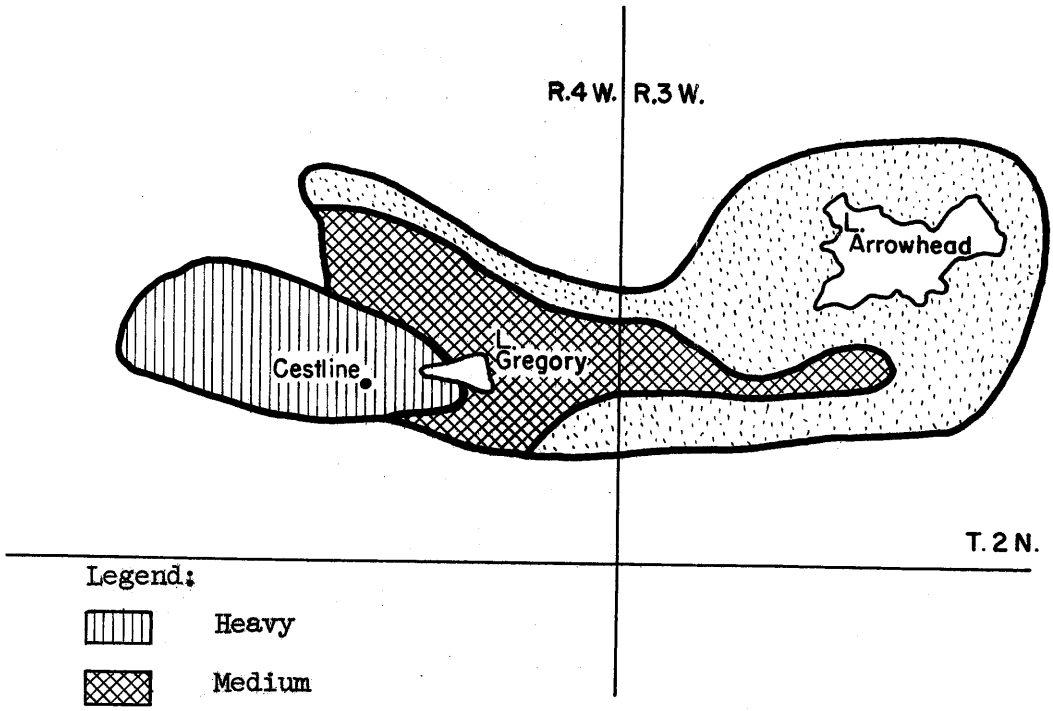
The cause of the dieback of the needles has not been diagnosed, but from present evidence it does not appear to be due to insects or fungi. Research is needed to determine the cause and find means of preventing the damage. There is considerable local concern about the problem on the part of the private and public landowners, coupled with a desire to take action. Since the problem does not appear to be entomological, the rsponsibility for an action program appears to lie outside the forest insect research field.

Berkeley, California
July 10, 1956

R. E. Stevens, Entomologist
R. C. Hall, Entomologist

Figure 1

DISTRIBUTION AND INTENSITY OF NEEDLE DIEBACK
Arrowhead-Crestline Area
San Bernardino National Forest



Legend:

Heavy

Medium

Light

Scale: ⟵⟶ 1 mile

Figure 2

DISTRIBUTION AND INTENSITY OF SCALE INFESTATION
Arrowhead-Crestline Area
San Bernardino National Forest